REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 82-111 are in the case.

I. CLAIM OBJECTIONS

Claim 1 is objected to because there are two claims numbered as 91. This error has been corrected in the revised claims.

II. THE 35 USC 101 REJECTION

Claims 102-111 stand rejected under 35 USC 101 because the claimed invention is directed to non statutory subject matter. Applicant proposes to amend claims 102-111 by focusing the claims instead on "A computer readable medium having stored thereon a computer program....". Withdrawal of this rejection is now respectfully requested.

III. THE 35 USC 103 REJECTION

Claims 82-112 stand rejected under 35 USC 103(a) as allegedly unpatentable over US patent 6,106,466 to Sheehan et al in view of US patent 5,687,737 to Branham et al. This rejection is respectfully traversed.

The method of the invention as defined in the revised claims is directed to assessing one or more characteristics of an organ or part thereof from multiple images of the organ or part thereof. The method comprises the steps of defining the spatial position of at least two of the images and forming an initial fit between a reference

model of the geometric shape of the organ or part thereof and the images according to reference markers on the images.

The method displays to the user an acquired image of the subject organ or part thereof. The image includes at least one organ boundary derived from an intersection of a surface of the organ with the plane of the image. An initial fit of the reference model is displayed to the user by displaying on the acquired image a representation of the intersection of the model with the plane of the image.

The user is able to manually user define one or more reference guide points on a user selected organ boundary on the image displayed to the user, for which the spatial positions have been defined. The method provides immediate feedback by improving the fit of the model to the guide points on user definition of the or each reference guide point.

The method also displays further images to the user and the user manually defines one or more reference guide points on further user selected images. Once again, the user is given immediate feedback on user definition of the or each reference guide point by immediately fitting the model to the reference points on user definition of the or each reference guide point. This highly interactive nature of the method defined in the revised claims enables a user to define an accurate model in a significantly shorter time than prior art methods.

Sheehan describes a method for defining a three dimensional surface of a patient heart. Sheehan does not describe or suggest displaying to the user a representation of the initial fit of the reference model by displaying on the acquired image a representation of the intersection of the model with the plane of the image

followed by manually user defining one or more reference guide points on a user selected organ boundary on the image displayed to the user.

The Action acknowledges that Sheehan's fitting process is an automatic process and does not require a user to manually define reference guide points on a user selected organ boundary on the image displayed to the user. In fact, the user is not able to manually define reference guide points in this way. It is only after significant processing work has been performed to fit the model that the user has an opportunity to determine if the results are acceptable. The Examiner is referred to column 17, lines 20-22, in which it is stated that decision block 244 is a further test that enables the user to determine if the results are acceptable. The user is then able to conduct manual edits following model fitting.

The Examiner has observed that, in Sheehan, a user can manually edit the abstract mesh of the mesh model for each image of the patient's heart. However, the Examiner acknowledges that Sheehan does not explicitly state the editing steps, and the Applicant points out that there is no description as to the nature of this manual editing performed by the user. As further acknowledged by the Examiner, Sheehan does not describe the editing steps. Moreover, Sheehan does not describe the interactive nature of fitting a reference model by involving the user early on in defining reference guide points.

The Examiner states that Branham et al describes adjusting a standard mesh model to provide a closer approximation. Branham describes the display of electrical activity in the heart. In order to obtain a three dimensional model of the heart, Branham uses either MRI imaging of a dead human or animal heart or photographic or

histological methods to obtain the necessary data. Branham describes one possibility of using an MRI scanner to generate images of the heart of a patient having heart trouble. (Column 16, line 63-column 17, line 2). Branham also describes adjusting a standard three dimensional model of a similar heart so that the adjusted model provides a closer approximation than the standard model. Branham further describes the creation of a three-dimensional model from the data particularly from column 14, line 56 through column 21, line 15. The user views an image and manually places some points around the inside (endocardium) and outside (epicardium) of the heart. An operator using a handheld electronic mouse marks a number of points along each epicardial or endocardial surface displayed in the image (column 17, lines 35-38). The computer enters user selected locations as data points and records the x and y coordinates. As the curser is moved away, the computer leaves behind a small colored dot to indicate the location of that point. (Column 17, lines 43-47). In this manner, the operator moves around the shape of the curve and marks a series of points on the curve. (Column 17, lines 47-49).

Branham requires the user to define a reasonably uniform distribution of guide points. The operator moves around the shape of a curve (column 17, lines 47 and 48). A small tight curve requires guide points a few millimeters apart whereas a large or smooth curve requires guide points a centimeter or more apart (column 17, lines 51-53).

Branham discloses that a relatively small number of vertices, such as about five, are adequate to depict a small circle such as the endocardial surface near an end of an atrial or ventricular cavity. Branham also states that a much larger number of vertices such as thirty or more is used to mark the epicardial surface of the entire heart near the

vertical mid point. (Column 17, line 64 to column 18, line 2). Branham states that an experienced operator can complete a section in one minute. Depending on the size of the heart and the spacing of the sections along the z access, an entire set of vertices depicting all of the surfaces in a heart can be completed in about one to three hours. (Column 18, line 32-37).

It is only after definition of all vertices that these vertices are then optionally interpolated to give a contour which is then used to create additional vertices on each slice. A polygon is converted into a smoother depiction of the curve by "splining". (Column 18, lines 38-41). Throughout the definition process of vertices, Branham does not provide for any feedback to the user. There is no interactive feedback.

In the present invention as defined in the amended claims, as a user defines a reference guide point, the reference guide point is converted to coordinates defining the three dimensional position of the guide points, the fit of the model is improved and a representation of the improved fit of the model is immediately displayed to a user. This occurs on user definition of the or each reference guide point. The definition of a single point initiates the refitting process. It is important to provide interactive feedback to a user in defining the reference guide points. The importance of this interactive guide point definition process is self evident by operation of the respective systems.

Branham discloses that the process takes one to three hours to define a single static model (column 18, lines 35-37). By contrast, by providing immediate user feedback on definition of reference guide points, the present invention enables the definition of twenty models in approximately five minutes. The present invention

provides a significant time saving and resulting commercial advantage over the Branham system.

In Branham, the placement of points is no more than simple manual contouring or editing using a uniform distribution of points rather than lines with the model fitted to this data. Branham does not provide any of the immediate feedback of guide point modeling and interactive display of results as defined in the amended claims of the present application. The present invention, by contrast, does not require a uniform distribution of guide points. The user defines guide points where they are needed in order to improve model fit. The present invention provides immediate feedback to the user.

Based on the above, it is clear that, at the time the present invention was made, it would not have been obvious to a person of ordinary skill in the art to combine Sheehan and Branham with an interactive guide point driven feedback process. Branham does not describe or suggest the interactive definition of reference guide points followed by model fitting and improved model display. If one of ordinary skill did attempt to combine Sheehan with Branham, this would still result in almost the entire model fitting process being conducted automatically initially followed by some manual editing using the Branham process. Such a combined system would not enjoy the advantage of the present application of seeking user input early on in the model definition process. Furthermore, the user input does not achieve the interactive nature of that described and claimed in the present application.

In light of the above, it is clear that one of ordinary skill would not have been motivated to arrive at the presently claimed invention based on the combined

disclosures relied on by the Examiner. Absent any such motivation, it is clear that a *prima facie* case of obviousness has not been generated in this case. Reconsideration and withdrawal of the outstanding obviousness rejection are accordingly respectfully requested.

Favorable action on this case is awaited.

Respectfully submitted,

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